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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

WAYMO LLC,

Plaintiff,

vs.

UBER TECHNOLOGIES, INC.; OTTOMOTTO LLC; OTTO TRUCKING LLC,

Defendants.

CASE NO. 3:17-cv-00939

PLAINTIFF WAYMO LLC'S OPENING CLAIM CONSTRUCTION BRIEF

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I. INTRODUCTION

Pursuant to the Patent Local Rules, Waymo hereby provides its opening claim construction brief for the three disputed terms at issue for U.S. Patent 9,368,936 (the "'936 Patent"). The asserted claims of the '936 Patent use well-known engineering terms and phrases like "diode," "charging path" and "immediately" according to their plain and ordinary meanings. The asserted claims are full of other similar technical terms that Uber agrees need no construction and are entitled to their plain and ordinary meaning. These three terms are no different. For "diode," Uber does not even dispute that the plain and ordinary meaning applies, but instead wants to apply an incorrect formulation of its own version of the "plain and ordinary" meaning. Uber's own cited dictionary definitions in support of its construction even contradict one another and its proposed construction.

For "charging path" there is similarly no special meaning in the claims—it is a path for charging. Ignoring the intrinsic record, Uber baldly seeks to import a specific limitation—one expressly contained in an non-asserted dependent claim—for the sole purpose of avoiding infringement. This is not permitted under black letter Federal Circuit law.

Finally, Uber claims that the word "immediately" renders an entire group of dependent claims indefinite, though a cursory review of the patent specification provides objective evidence that a person of ordinary skill would be able to use to understand the scope of the claim. There is no reasonable question that a person of ordinary skill would be able to understand the term "immediately" with reasonable certainty based on the '936 patent specification's examples.

II. LEGAL STANDARDS

"[T]he words of a claim are generally given their ordinary and customary meaning." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) *(en banc)* (internal quotation omitted). "[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention[.]" *Id.* at 1313. "Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id.* "Such intrinsic evidence is the most significant source of the legally operative

meaning of disputed claim language." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

"It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips*, 415 F.3d at 1312 (internal quotations omitted). "Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms." *Id*. at 1314. In addition to the claims, the specification "is always highly relevant to the claim construction analysis." *Id*. at 1315 (quoting *Vitronics*, 90 F.3d at 1582). As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Thorner v. Sony Computer Entertainment America LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) ("We do not read limitations from the specification into claims; we do not redefine words. Only the patentee can do that."); *Inline Plastics Corp. v. EasyPak LLC*, 799 F.3d 1364, 1368-69 (Fed. Cir. 2015) (quoting *Phillips*, 415 F.3d at 1313) ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.").

There are only two exceptions to the general rule that general rule that words of a claim are given their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner*, 669 F.3d at 1365. These standards are "exacting." *Id.* at 1366. "To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning" and "clearly express an intent to redefine the term." *Id.* at 1365. Disavowal requires "a clear and unmistakable disclaimer." *Id.* at 1366-67.

Although courts have discretion to consider extrinsic evidence, including dictionaries, scientific treatises, and testimony from experts and inventors, such evidence is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips,* 415 F.3d at 1317-18 (internal quotations omitted). Indeed, "extrinsic evidence in general, and expert testimony in particular, may be used only to help the court come to the proper understanding of the claims; it may not be used to vary or contradict the claim language." *Vitronics*, 90 F.3d at 1584. "[C]onclusory, unsupported assertions by experts as to the definition of a claim term are not useful to

a court. Similarly, a court should discount any expert testimony that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent." *Phillips*, 315 F.3d at 1318.

Patent claims must also be "definite," which means that they must "particularly point[] out and distinctly claim[] the subject matter that the applicant regards as the invention." 35 U.S.C. § 112, ¶ 2. The Supreme Court has recently clarified that the definiteness standard is satisfied when the patent claims "viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). Terms of degree do not automatically render a claim indefinite. *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370 (Fed. Cir. 2014) ("[C]laim language employing terms of degree has long been found definite where it provided enough certainty to one of skill in the art when read in the context of the invention."). The definiteness standard does not require "absolute or mathematical precision," but simply that the claims, read in light of the specification and prosecution history, "provide objective boundaries for those of skill in the art." *Id.* at 1370-71. In all cases, it is the challenger's burden to prove indefiniteness by clear and convincing evidence. *Nautilus*, 134 S. Ct. at 2130, n. 10.

III. <u>THE '936 PATENT</u>

A. Background and Summary

The '936 Patent is titled, "Laser Diode Firing System" and names Samuel W. Lenius and Pierre-yves Droz as inventors. The patent was filed on December 18, 2013, and claims priority to U.S. Provisional Application No. 61/884,762, filed September 30, 2013. The patent issued on June 14, 2016.

The '936 Patent discloses an improved firing system for laser diodes that are at the heart of a LiDAR system. *See* Declaration of Andrew Wolfe, Ph.D. ("Wolfe Decl.") ¶ 25. Laser diodes generate pulses of light that are transmitted through optical components of the LiDAR system and into the surrounding environment. *Id*. The light pulses reflect off of objects in the environment and return to the LiDAR system where they are detected by a series of photodetectors. *Id*. The LiDAR system measures the "time of flight" for each light pulse to be emitted and detected in order to determine the

distance to the reflecting object. *Id.* The laser diodes can be rapidly and repeatedly fired to collect information about the surrounding environment and generate a three-dimensional map representing the environment. *Id.* The three-dimensional map is then used to make navigation decisions, such as whether to stop or turn to avoid an upcoming object. *Id.*

To detect objects accurately, the timing of laser pulses must be fast and reliable. *Id.* ¶ 26. More laser pulses means more detection points over a given period of time, and therefore a more accurate map of the surrounding environment. *Id.* Accurately timing the laser pulses ensures that the "time of flight" measurement accurately represents the distance to the detected object. *Id.*

In order to generate a pulse of light, a voltage is applied across the laser diode. A firing circuit is responsible for generating that voltage. *Id.* ¶ 27. The firing circuit includes a voltage source and other circuit components that work together to generate and supply a pulsed current to the laser diode, causing it to emit light. *Id.* The firing circuit in the '936 Patent quickly and reliably provides a voltage across a laser diode in order to generate the light pulses needed for detection. *Id.* One feature of the firing circuit is that it uses a single transistor to control the circuit's charge cycle and emission cycle. *Id.* The circuit begins charging as soon as the laser diode stops emitting light, with no lag between the end of the emission cycle and the beginning of the charge cycle. *Id.* The circuit is recharged and ready to fire more quickly, and more light pulses can be emitted over a given time interval. *Id.* More light pulses lead to more data points, and therefore a more accurate mapping of the environment. *Id.*

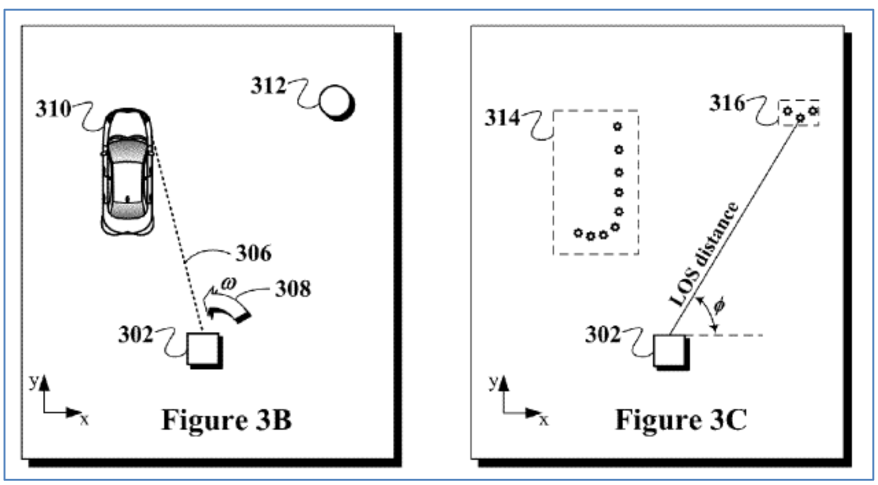
B. Specification

The specification of the '936 Patent describes different aspects of a LiDAR system used for autonomous vehicle navigation. '936 Patent at 1:16-46. Figure 1 of the patent shows a block diagram of an autonomous vehicle 100 equipped with a LiDAR system. The vehicle includes a propulsion system 102, an engine 118, an energy source 119, a transmission 120, and wheels 121. *Id.* at 6:16-7:4, Fig. 1. The vehicle 100 also includes a computer system 112 to control the vehicle in an autonomous mode via control instructions to a control system 106, and a sensor system 104. *Id.* at 5:65-6:8. The sensor system 104 detects information about the environment surrounding the vehicle 100. *Id.* at 7:5-

17. The sensors include a Global Positioning System (GPS), inertial measurement unit (IMU) 124, a RADAR system 126, and a LIDAR system. *Id*. at 7:5-39.

An example LiDAR system disclosed in the '936 Patent includes a light source , beam-steering optics, a light sensor, and a controller. *Id*. at 12:55-13:14. The laser diodes emit pulses of light toward the beam-steering optics, which direct the pulses of light across a scanning environment. *Id*. Objects in the scanning environment reflect the emitted pulses of light back to the LiDAR system, where they are detected by the photo detectors. *Id*. The controller can also be configured to estimate the position of objects that reflect the light pulses back to the LiDAR system. *Id*. For example, the controller can measure the time delay between emission of a pulse of light and reception of a reflected light signal and calculate the distance to the reflective object based on the time of flight of a round trip. *Id*. The controller may also use the orientation of the beam-steering optics at the time the pulse of light is emitted to estimate a direction toward the reflective object. *Id*. The estimated direction and estimated distance can then be combined to generate a three-dimensional "point cloud" representing the distance of the reflective object relative to the LiDAR system. *Id*.

Figures 3B and 3C show how the LiDAR system detects a car 310 and a tree 312, and generates a point cloud representing these objects 314 and 316:



Id. Figs. 3B and 3C; 13:50-1428.

Figures 4A and 4B show an example of the LiDAR system scanning an environment by emitting laser pulses along beam paths 306a through 306d at equal angular intervals, along with a timing diagram representing the transmission and detection of the light pulses:

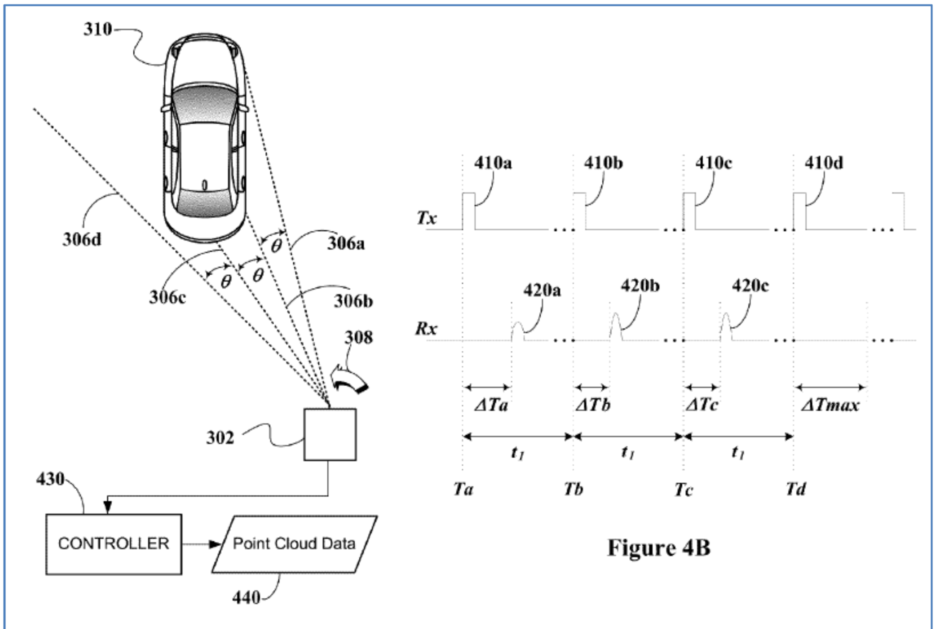
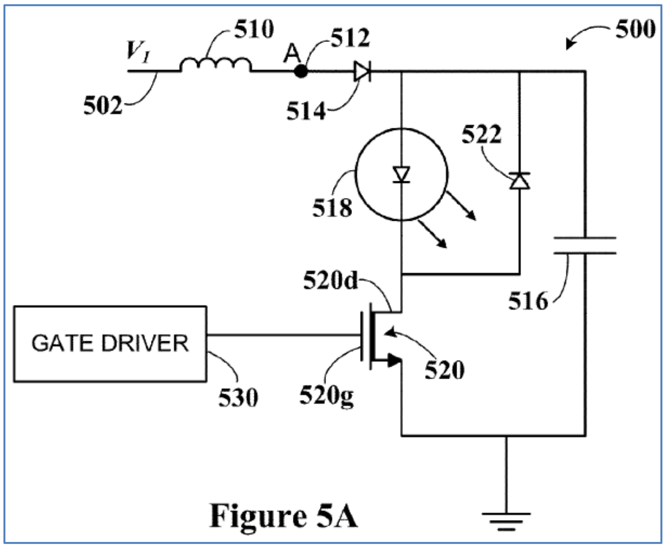


Figure 4A
Figure 4B

Id. at Figs. 4A and 4B; 14:63-15:36.

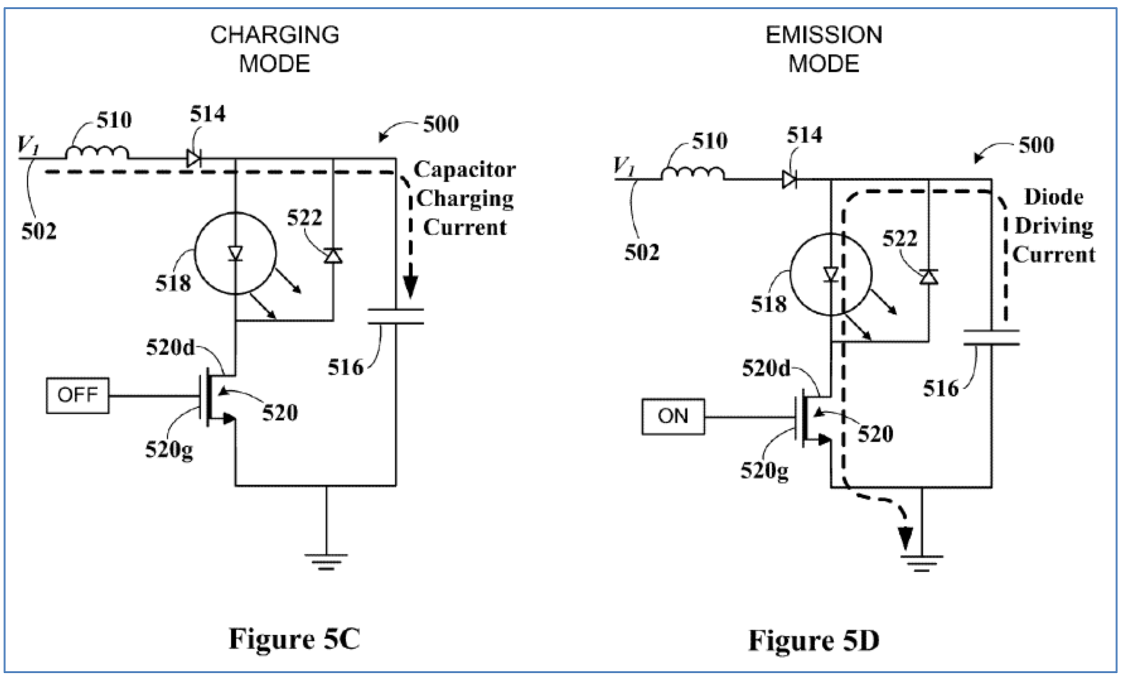
The pulses 410a through 410d are fired at equal time intervals t_1. However, the detected signals 420a through 420d are received at different times because they travel different distances to and from the detected object. The time interval ΔTa is longer than the time interval ΔTb because the front of the car is a further distance away from the LiDAR system than the back of the car. The time interval ΔTmax represents the fact that laser pulse 410d travels along a beam path 306d that does not hit any reflective object.

The specification explains that "[a] light pulse with the desired temporal profile can be generated by applying a rapidly switched current to a laser diode (*e.g.*, a current source that rapidly transitions from near zero current to a current sufficient to cause the laser diode to emit light)." *Id.* at 17:26-40. The specification refers to the circuits necessary to generate the current as "laser diode firing circuits." *Id.* Figure 5A depicts an example laser diode firing circuit:



Id. at Fig. 5A.

The circuit 500 includes a voltage source 502, inductor 510, reference node A 512, diode 514, charge capacitor 516, laser diode 518, transistor 520, gate driver 530, and discharge diode 522. *Id.* at 17:47-63. The components work to provide a charging mode and an emission (or discharge) mode, shown in Figures 5C and 5D, respectively:



Id. at Figs. 5C and 5D.

In charging mode, the voltage across the capacitor 516 starts out lower than the voltage at reference node A. *Id.* at 22:38-55. The transistor 520 is off, which prevents current from flowing

through the laser diode 518. *Id.* The current is directed from the voltage source 502, through the inductor 510, through the diode 514, and to the capacitor 516 allowing it to accumulate charge. *Id.* In emission (or discharge) mode, the transistor 520 is turned on, allowing the capacitor to rapidly discharge through the laser diode 518 causing it to emit light. *Id.* at 22:54-67.

A benefit of the circuit shown in Figure 5A is that it uses a single transistor to control the charging and discharging operations. *Id.* at 25:21-32. Turning the single transistor on will cause the circuit to emit a pulse of light by discharging the capacitor through the laser diode. Turning the transistor off will cause current to flow into the capacitor in order to recharge it. *Id.*

Figure 5B is a timing diagram that plots the state of different components during emission (or discharge) and charging of the firing circuit 500:

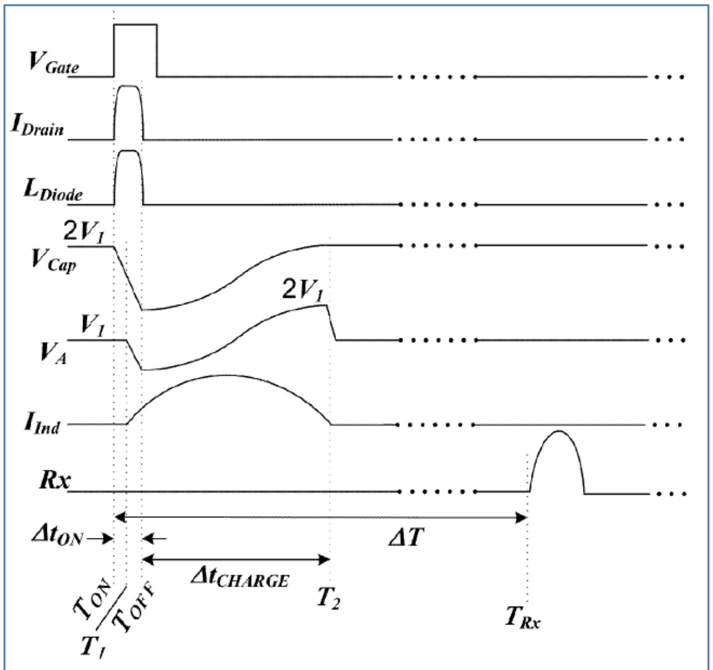


Figure 5B

Id. at Fig. 5B.

The horizontal axis of the timing diagram defines five specific times: T_{ON}, T_1, T_{OFF}, T_2, and T_{RX}. *Id.* at 19:14-24. It also defines three specific time intervals: Δt_{ON}, Δt_{CHARGE}, and ΔT. *Id.* Time T_{ON} represents point at which the transistor 520 is turned on to discharge the capacitor 516 through the laser diode 518. *Id.* Time T_{OFF} represents the point at which the transistor 520 is turned off in order to stop current from flowing into the laser diode 518. *Id.* at 19:55-60. Time interval Δt_{ON} represents the

interval between T_{ON} and T_{OFF} that it takes to discharge the capacitor through the laser diode in order to emit a pulse of light. *Id.* After the transistor is turned off at time T_{OFF}, the capacitor begins the process of recharging. *Id.* at 21:53-22:11. The capacitor recharges over the time interval Δt_{CHARGE} until time T_2. *Id.* Time interval ΔT represents the roundtrip time for the LiDAR system to emit and detect the pulse, between T_{ON} and T_{RX}. *Id.* at 22:13-22. Time T_1 represents the point at which current begins flowing into the inductor 510 shortly after the transistor is turned on. *Id.* at 20:3-11.

The vertical axis of Figure 5B represents the value of different circuit components over time. Voltage V_{Gate} represents the voltage on the transistor 520. *Id.* at 19:14-24. Luminance L_{Diode} represents the light emission from the laser diode 518. *Id.* Voltage V_{Cap} represents the voltage on the capacitor 516. *Id.* Voltage V_A represents the voltage at reference node A. *Id.* Current I_{Ind} represents the current through the inductor 510. *Id.* At time T_{ON}, the voltage on V_{Gate} is applied to the gate of transistor 520 in order to turn it on. *Id.* at 19:25-40. The voltage V_{Cap} on the capacitor 516 decreases from its maximum value $2V_1$ to zero as the capacitor discharges through the laser diode 518. *Id.* The luminance L_{Diode} of the laser diode peaks as it emits a pulse of light. *Id.*

The timing diagram in Figure 5B demonstrates that the capacitor 516 is recharged immediately following a pulse emission. *Id.* at 21:53-22:11. The specification describes this operation as follows: "If, for example, a recharging operation were to be initiated after some duration following a pulse emission (e.g., using a second transistor other than a transistor controlling current through a laser diode), the additional time would increase the lag time between emission of subsequent pulses and thus reduce the duty cycle of the firing circuit." *Id.* In order to shorten the duty cycle, "the firing circuit 500 is configured to immediately recharge the capacitor 516 upon emission of a pulse because the recharging operation is initiated in response to operation of the same transistor 520 that initiates emission (e.g., turning on the transistor 520 both causes a pulse to be emitted and, upon sufficient discharge from the capacitor 516, causes the diode 514 to become forward biased and current to begin flowing through the inductor 510 so as to initiate charging)."

C. Prosecution History

The application underlying the '936 Patent was filed on December 18, 2013. On March 2, 2016, the Patent Examiner allowed all of the pending claims. In his Reasons for Allowance, the

Examiner explained cited U.S. Patent No. 9,185,762 ("Mark") as an example of a "typical laser driver circuit." The Examiner explained that Mark does not teach or suggest the configuration shown in Figure 5A of the '936 Patent.

D. Asserted Claims

Waymo has asserted claims 1, 3, 5-7, 9, 11, 14, 16, 17, 19, and 20. Independent claim 17 and dependent claim 19 are reproduced below.

> 17. A light detection and ranging (LIDAR) device comprising:
>
> a light source including:
>
> a voltage source;
>
> an inductor coupled to the voltage source, wherein the inductor is configured to store energy in a magnetic field;
>
> a diode coupled to the voltage source via the inductor;
>
> a transistor configured to be turned on and turned off by a control signal;
>
> a light emitting element coupled to the transistor;
>
> a capacitor coupled to a charging path and a discharge path, wherein the charging path includes the inductor and the diode, and wherein the discharge path includes the transistor and the light emitting element;
>
> wherein, responsive to the transistor being turned off, the capacitor is configured to charge via the charging path such that a voltage across the capacitor increases from a lower voltage level to a higher voltage level and the inductor is configured to release energy stored in the magnetic field such that a current through the inductor decreases from a higher current level to a lower current level; and
>
> wherein, responsive to the transistor being turned on, the capacitor is configured to discharge through the discharge path such that the light emitting element emits a pulse of light and the voltage across the capacitor decreases from the higher voltage level to the lower voltage level and the inductor is configured to store energy in the magnetic field such that the current through the inductor increases from the lower current level to the higher current level;
>
> a light sensor configured to detect a reflected light signal comprising light from the emitted light pulse reflected by a reflective object; and
>
> a controller configured to determine a distance to the reflective object based on the reflected light signal.

* * * * *

> 19. The LIDAR device of claim 17, wherein the capacitor is charged immediately following emission of a pulse of light from the light emitting element.

’936 Patent at claims 17 and 19.

As shown, claim 17 is directed to a LiDAR device that comprises elements of the firing circuit disclosed in the patent specification, including an inductor, diode, capacitor, transistor, and light emitting element. The capacitor is coupled to a charging path and a discharge path, where the charging path includes the inductor and the diode, and the discharge path includes the transistor and the light emitting element. The operation of the transistor controls both the charging and discharge of the capacitor. The claimed LiDAR device also includes a “light sensor” to detect reflected light emitted from the light emitting element. It also includes a “controller configured to determine a distance to the reflective object based on the reflected light signal.” Dependent claim 19 specifies that the capacitor is charged immediately following emission of a pulse of light from the light emitting element.

E. Level of Ordinary Skill in the Art

The ’936 Patent was filed on December 18, 2013, and claims priority to a provisional application filed September 30, 2013. A person of ordinary skill in the art at this time would have had an undergraduate degree in electrical engineering, with at least two years of experience designing electrical circuits for light-emitting semiconductor devices such as light-emitting diodes or laser diodes. Wolfe Dec. ¶ 48.

IV. <u>DISPUTED TERMS</u>

A. “diode”

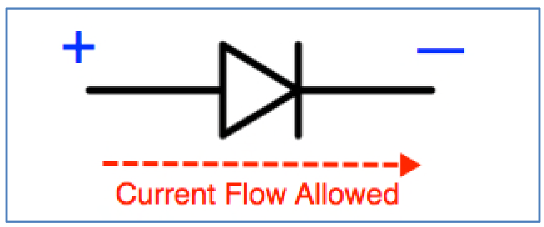
Waymo’s Proposed Construction	Defendants’ Proposed Construction
Plain meaning	“a two terminal semiconductor device with an anode and a cathode that allows the flow of current in one direction only”

The term “diode” appears in each of the asserted independent claims. Independent claim 1 is representative and recites, “a ***diode*** coupled to the voltage source via the inductor … a capacitor coupled to a charging path and a discharge path, wherein the charging path includes the inductor and

the ***diode***." '936 Patent at Claim 1 (emphasis added). Waymo's proposed construction reflects the fact that a diode is a well-known electrical device with a well-understood operation. Defendants' proposed construction limits the understood meaning of the term, is technically inaccurate, and does nothing to assist the jury in evaluating infringement and invalidity of the '936 Patent.

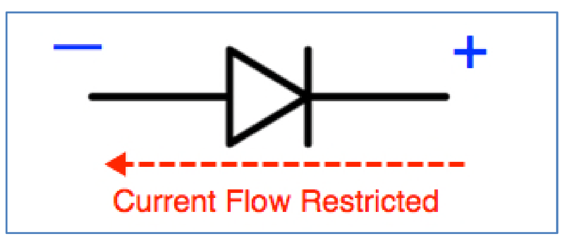
1. The Intrinsic Record Does Not Justify Departing from the Plain Meaning of the Term "diode"

Much like an inductor or a capacitor, a diode is a well-known electrical device with a well-understood operation. Wolfe Decl. ¶ 51. A diode has two terminals and allows current to flow more easily in one direction than the other depending on the voltages applied across the terminals. *Id.* When a positive voltage is applied across the terminals, the diode can become "forward biased" and allows current to flow in the forward direction, as illustrated below:



Id.

When a negative voltage is applied across the terminals, the diode can become "reverse biased" and restricts current flow in the reverse direction, as illustrated below:



Wolfe Decl. ¶ 52.

The specification of the '936 Patent uses the term "diode" consistent with its understood meaning. *Id.* ¶ 56. The specification explains that the diode is part of the charging path for the firing circuit. '936 Patent at 18:28-38, 22:38-53, Fig. 5C. During the charge cycle, the diode becomes forward biased in order to allow current flow into the capacitor. *Id.* at 18:35-37 ("The diode 514 is forward biased (and thus allows the capacitor 516 to charge) when the voltage at node A 512 is greater

than the voltage on the capacitor 516.”). The specification further explains that “[t]he diode is also configured to be reverse biased when the voltage across the capacitor exceeds the voltage applied to the diode by the inductor (to thereby prevent the capacitor from discharging).” *Id*. at 5:12-16. These descriptions track the normal operation of a diode as understood by persons of ordinary skill in the art. Wolfe Decl. ¶ 56.

Conversely, there is no indication in the intrinsic record that the inventors intended a meaning of the term “diode” different than its accepted meaning in the art. *Id.* The specification and prosecution history do not contain any definitional statements or lexicography that would suggest the inventors intended a different or narrower meaning for the term “diode.” Nor is there any disavowal concerning the scope of the term “diode.” Absent lexicography or disavowal, there is no reason to depart from the accepted meaning of the term. *See Thorner*, 669 F.3d at 1365 (“The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history. There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.”) (internal citation omitted).

2. Defendants’ Construction of “diode” is Based on a Single Dictionary Definition, Is Technically Inaccurate, and Is Not Helpful to a Jury

Despite the fact that a diode is a known electrical device with an understood operation, Defendants propose a highly specific definition that requires “a two terminal semiconductor device with an anode and a cathode that allows the flow of current in one direction only.” The Court should reject this construction.

First, the construction is based on a single dictionary definition that conflicts with other dictionaries. Defendants’ construction recites, “A two terminal semiconductor device with an anode and a cathode that allows the flow of current in one direction only.” The construction reflects a definition of “diode” from the McGraw Hill Illustrated Dictionary of Electronics (2001), which recites, “A two-element device containing an anode and a cathode, and providing unidirectional conduction.” Declaration of Jordan Jaffe (“Jaffe Decl.”) Ex. 1 at 15.

Both the McGraw Hill definition and Defendants' proposed construction conflict with other dictionary definitions, including those that Defendants cited in their Patent Local Rule 4-2 identification of extrinsic evidence. *Id.* at 23. For example, the Modern Dictionary of Electronics (1999) provides a series of definitions, including "A two-element electron tube or solid-state device," and "A two-terminal electronic device that will conduct electricity much more easily in one direction than in the other." *Id.* Two other definitions from the Authoritative Dictionary of IEEE Standard Terms (2000) include "A two-electrode electron tube containing and anode and a cathode" and "A semiconducting device used to permit current flow in one direction and to inhibit current flow in the other direction." *Id.* Ex. 2.

The Federal Circuit has cautioned that "different dictionaries may contain somewhat different sets of definitions for the same words," and "[a] claim should not rise or fall based upon the preferences of a particular dictionary editor." *Phillips*, 415 F.3d at 1322. Here, it would improper to adopt Defendants' definition of diode, which is limited to devices that "allow the flow of current ***in one direction only***," when competing definitions make clear that diodes allow current to flow in both directions. Jaffe Ex. 1 at 23 ("A two-terminal electronic device that will conduct electricity much more easily in one direction than in the other."); Ex. 2 ("A semiconducting device used to permit current flow in one direction and to inhibit current flow in the other direction."). It would also be improper to adopt Defendants' requirements that a diode is a semiconductor device that includes an anode and a cathode, when multiple dictionary definitions do not include those elements.[1]

Second, Defendants' construction is technically inaccurate. As the dictionary definitions above make clear, a diode does not "allow the flow of current ***in one directly only***" as Defendants propose. A person of ordinary skill in the art would understand that forward biasing a diode allows current to flow in the forward direction, while reverse biasing the diode restricts current flow in the reverse direction but it does not block it entirely. Wolfe Decl. ¶¶ 53-55, 57, 58. Some amount of

[1] Defendants' construction of "diode" is also inconsistent with the '936 Patent specification. In describing a "discharge diode"—which is not part of the claims at issue—the specification explains that the diode "***may*** have an anode and a cathode." '936 Patent at 18:1-4. Defendants' proposed construction is narrower because it specifically requires an anode and cathode.

current—referred to as "leakage"—will flow in the reverse direction. *Id.* He or she would also understand that diodes have a characteristic "breakdown" region in which current flows in the reverse direction. *Id.* These characteristics of a diode are reflected in the definitions cited above from the Modern Dictionary of Electronics and the Authoritative Dictionary of IEEE Standard Terms. Wolfe Decl. ¶ 59; Jaffe Decl. Ex. 1 at 23 ("A two-terminal electronic device that will conduct electricity much more easily in one direction than in the other."); Ex. 2 ("A semiconducting device used to permit current flow in one direction and to inhibit current flow in the other direction."). Defendants' construction of "diode" would exclude these characteristics and result in a technically inaccurate definition.

Because Defendants' definition adds unnecessary requirements to the claims and is technically inaccurate, it will not help the jury in resolving issues of infringement and invalidity. The construction should be rejected and the plain meaning of "diode" should apply.

B. "charging path"

Waymo's Proposed Construction	Defendants' Proposed Construction
Plain meaning	"a path allowing current to flow from the inductor to the capacitor, the path configured to charge the capacitor to a voltage higher than the supply voltage"

The term "charging path" appears in each of the asserted independent claims. Independent claim 1 is representative and recites, "a capacitor coupled to a ***charging path*** . . . the capacitor is configured to charge via the ***charging path***." '936 Patent at Claim 1 (emphasis added). Waymo's proposal reflects the fact that the term "charging path" has a readily understood meaning in the context of the patent claims and specification. Defendants' proposed construction needlessly complicates the term by importing a limitation from a non-asserted dependent claim.

1. The Term "charging path" Has a Plain Meaning that Does Not Require Construction

In the context of the asserted claims, the "charging path" plainly refers to a path for charging the capacitor. '936 Patent at Claim 1. The claim language sets forth the requirements of the charging

path—*i.e.*, that it is coupled to the capacitor and includes an inductor and diode. *Id.* Nothing in the intrinsic record justifies importing additional requirements beyond those expressly recited in the claims. There is no lexicography or disavowal in the patent specification or prosecution history, or any other evidence that the inventors sought to restrict the plain and ordinary of the terms "charging path." Accordingly, the term should be construed to have its plain meaning. *See Thorner*, 669 F.3d at 1667-68 (finding that the district court erred in construing the term "attached" to mean "affixed to an exterior surface" because the plain and ordinary meaning encompassed either internal or external attachment.).

2. Defendants' Construction Violates the Doctrine of Claim Differentiation and Reads In A Limitation from the Specification

Defendants' proposed construction—that the charging path must be configured to charge the capacitor to a voltage ***higher than the supply voltage***—reads a limitation into the independent claims that is squarely recited in the dependent claims. Dependent claim 4—which is not asserted—depends from claim 1 and recites, "wherein the higher voltage level is greater than the voltage source…." '936 Patent at Claim 4.[2] The "higher voltage" recited in claim 4 refers to the voltage on the capacitor recited in claim 1. *Id.* at Claims 1 ("a voltage across the capacitor increases from a lower voltage level to a higher voltage level…."). Thus, claim 4 adds the requirement that the capacitor in claim 1 is charged to a higher voltage that is greater than the voltage of the voltage source. That is the exact same requirement that Defendants' are trying to add to claim 1 through their proposed construction, as illustrated in the table below:

Defendants' Proposed Construction of "charging path"	**Dependent Claim 4 of the '936 Patent**
"a path allowing current to flow from the inductor to the capacitor, the path configured to charge the capacitor ***to a voltage higher than the supply voltage***" (emphasis added)	"4. The apparatus of claim 1, ***wherein the higher voltage level is greater than a voltage of the voltage source***, ..." (emphasis added)

[2] Non-asserted dependent claim 12, which depends from asserted independent claim 9, recites the same requirement as dependent claim 4. '936 Patent at Claim 12.

Defendants' proposed construction violates the basic principle of claim differentiation, which holds, "the presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim." *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004). Here, dependent claim 4 adds the requirement the capacitor is charged to a voltage greater than that of the voltage source. Thus, claim 1 should not be construed to add that same requirement. *Id.*; *see also SRI Intern. v. Matsushita Elec. Corp. of Amer.*, 775 F.2d 1107, 1122 (Fed. Cir. 1985) (*en banc*) ("It is settled law that when a patent claim does not contain a certain limitation and another claim does, that limitation cannot be read into the former claim in determining either validity or infringement.").

Defendants' proposed construction also improperly limits the claims to a specific embodiment. The specification explains that the capacitor may be charged to a voltage equal the voltage at node A 512 in the circuit of Figure 5A. '936 Patent at 18:58-60 ("The capacitor 516 charges until the voltage on the capacitor 516 is approximately equal the voltage at node A 512."). The specification further explains that, during a charging operation, "the voltage at node A ***may increase to a higher level voltage*** (e.g., a voltage greater than V_1)," where V1 is the voltage of the voltage source. *Id*. at 18:48-55. By using the word "may," the specification makes clear that it is optional whether the voltage at node A—and thus, the voltage on the capacitor—increases to a voltage greater than that of the power source. Defendants' proposed construction improperly limits the claims to this optional embodiment of the specification. *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014) ("[W]e do not read limitations from the embodiments in the specification into the claims.").

C. "wherein the capacitor is charged immediately following emission of a pulse of light from the light emitting element"

Waymo's Proposed Construction	**Defendants' Proposed Construction**
Plain meaning	Indefinite

The phrase "wherein the capacitor is charged immediately following emission of a pulse of light from the light emitting element" appears in asserted dependent claims 3, 11, and 19. Waymo does not have the benefit of Defendants' briefing, but it appears that Defendants intend to argue that

the term "immediately" is subjective or imprecise and therefore renders these claims indefinite. This argument ignores the understanding of a person having ordinary skill in the art and the context of the patent specification—both of which must be considered as part of the indefiniteness analysis. *See Nautilus*, 134 S. Ct. at 2128 ("First, definiteness is to be evaluated from the perspective of someone skilled in the relevant art. … Second, in assessing definiteness, claims are to be read in light of the patent's specification and prosecution history."). Here, the specification provides detailed and objective guidance that provides a person of ordinary skill in the art with reasonable certainty concerning the scope of the claims.

1. The Specification Provides Timing Diagrams that Describe How the "capacitor is charged immediately following emission of a pulse of light from the light emitting element"

The phrase "wherein the capacitor is charged immediately following emission of a pulse of light from the light emitting element" refers to the transition between a discharge cycle and charge cycle of the firing circuit. Wolfe Decl. ¶ 64; '936 Patent at 21:53-22:11. The specification uses timing diagrams to illustrate this transition. *Id.* at 19:14-24, Fig. 5B. The timing diagrams are shown in Figure 5B, reproduced below with highlighting from Dr. Wolfe's declaration:

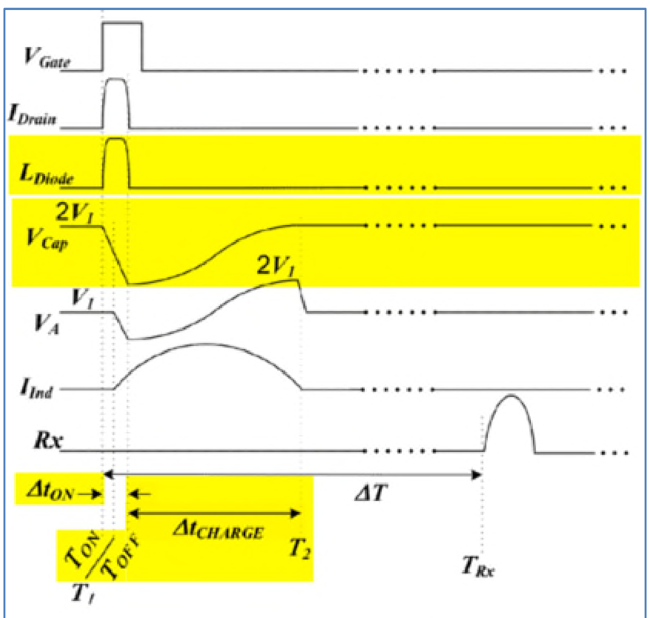


Figure 5B

Id. at Fig. 5B (annotated); Wolfe Decl. ¶ 65.

The plot labeled L_{Diode} shows the emission pulse of the laser diode as a function of time. *Id*. at 19:16-18. With reference to the bottom portion of the diagram, the laser diode begins emitting light at time T_{ON} and stops emitting light at time T_{OFF}. *Id*. at 19:33-40, 20:21-22. The plot labeled V_{Cap} refers to the voltage on the capacitor. *Id*. at 19:16-18. The voltage can be seen to decrease between time T_{ON} and time T_{OFF}, corresponding to the emission of light from the laser diode. *Id*. at 19:33-49, 20:21-25. Starting at time T_{OFF}, the voltage on the capacitor increases as it begins to charge. *Id*. The charge cycle lasts between time T_{OFF} and time T_2, represented as Δt_{CHARGE} at the bottom of the timing diagram. *Id*.

These timing diagrams inform a person of ordinary skill in the art about what it means for the capacitor to charge "immediately" following the emission of light because they show that current begins to flow to the capacitor and its voltage begins to increase as the emission of light from the laser diode ceases. Wolfe Decl. ¶ 67. A person of ordinary skill in the art would be familiar with these diagrams, could derive them for a given firing circuit, and could use them to determine if the firing circuit falls within the scope of the claims. *Id*.

Accordingly, the timing diagrams provide "objective boundaries" that would allow a person of ordinary skill in the art to determine the scope of the claims with reasonable certainty. *Interval Licensing*, 766 F.3d at 1344.

2. The Specification Describes the Use of a Single Transistor to Charge the Capacitor "immediately following emission of a pulse of light from the light emitting element"

The specification explains that the immediate charging of the capacitor results from the single-transistor operation of the firing circuit. *Id*. at 22:3-11 ("In some examples, the firing circuit 500 is configured to immediately recharge the capacitor 516 upon emission of a pulse because the recharging operation is initiated in response to operation of the same transistor 520 that initiates emission (e.g., turning on the transistor 520 both causes a pulse to be emitted and, upon sufficient discharge from the capacitor 516, causes the diode 514 to become forward biased and current to begin flowing through the inductor 510 so as to initiate charging)."). The specification describes the operation of the single transistor with respect to the timing diagrams of Figure 5B. The transistor turns ON at time T_{ON}, which results in current discharging through the laser diode to emit a pulse of light. *Id*. at 19:33-40

("At the turn on time T_{ON}, an initiating signal is applied to the transistor 520 from the gate driver 530. … The transistor 520 turns on and the drain current I_{Drain} transitions from a current near zero to a current sufficient to drive the laser diode 518. The laser diode 518 emits a pulse of light, as indicated by the luminosity L_{Diode}."). The transistor turns off at time T_{OFF}, which results in current ceasing to flow through the laser diode, and recharging of the capacitor. *Id.* at 20:21-22 ("At time T_{OFF}, current ceases flowing through the laser diode 518…"); *id.* at 21:55-58 ("As shown in FIG. 5B, a capacitor recharging interval Δt_{CHARGE} begins at the transistor turn off time T_{OFF}…").

The specification's description of the single-transistor design provides additional guidance for determining the scope of the claims that require the capacitor to charge "immediately following emission of a pulse of light from the light emitting element." Wolfe Decl. ¶¶ 68-69.

V. **CONCLUSION**

For the foregoing reasons, the Court should reject Defendants' proposed constructions and find the disputed claim terms to have their plain and ordinary meaning.

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